



Gaining Representations of Children's and Adults' Constructions of Sustainability Issues

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In this decade of Education for Sustainable Development, it is timely to consider the methodological issues associated with researching this topic not only with adults but also with the young children who, as members of the next generation, will experience the success or otherwise of current environmental sustainability efforts. We argue that it is important when making methodological choices to recognize that both the sustainability issues themselves and the way individuals learn about these issues, are socially and culturally constructed. In this article we are interested in ways of gaining representations of individuals' mental constructions of environmental sustainability issues. We recount experiences from two projects, one which used the approach of analyzing children's drawings to gain representations of how children in Mexico understand environmental issues and the other which employed adult participant-directed photography as the principal data collection method conducted mainly in the north of South Africa.

Key Words: children's drawings, participant-directed photography, sustainability, mental construction.

Introduction

In the now quite extensive literature on alternative approaches to research in environmental education (Mrazek, 1993; Robottom & Hart, 1993; Robottom, 2005), the distinction has frequently been made between two kinds of considerations – those of “methodology” and those of “method”. “Methodological” considerations tend to concern deeper philosophical issues involving the epistemological, ontological and ideological assumptions of the research approach. Methodological deliberations address the relationships between these philosophical assumptions on the one hand and the nature of the substantive research questions being addressed in the research on the other.

Considerations relating to “method” tend to be those at a more fine-grained level, concerned more directly with making choices about which data collection techniques out of a range of those available to actually employ in a given research project. Choices about method are more usually made on more pragmatic grounds such as which technique is most

likely to effectively gather relevant information. But of course, any choice about which data collection techniques to use needs also to be made with a view to congruence between method and methodology.

For example, there seem to be good grounds for adopting a socially constructivist perspective in research in environmental education. If it is agreed that in part environmental education entails being educative about environmental issues, the case is a double one: not only are environmental issues clearly socially constructed (since issues consist of a disagreement among social parties of human beings), but learners' apprehensions of such issues are also matters of individual construction of meaning (as articulated in the now highly-visible 'constructivism' hypothesis about how learners learn). If this methodological position is accepted, we need to address the question of which data collection methods are congruent with a (socially) constructivist approach to research, recognizing and respecting the significance of local social and cultural context in shaping human constructions of the environment. In short, if we are to conduct research in ways that are consistent with the socially constructivist nature of the field, we need to find means of accessing individuals' personal and social constructions of meaning.

In making a deliberate choice of data collection techniques in environmental education research that is congruent with a (socially) constructivist perspective on environmental issues and the way learners learn about such issues, what techniques suggest themselves? Of course, when adopting such an interpretive research approach with older children and adults, we often simply ask them about their environmentalist views and experiences – we gain a narrative account of people's constructions of environmental issues through various interview-based data collection strategies. We speak of 'giving participants a voice' in interpretive research, and this can be achieved literally through appropriate interviewing.

But the task of gaining representations of younger children's constructions of environmental issues is more challenging. Very young children sometimes lack the linguistic capacity to adequately present their understandings about their environmental setting. Even older, linguistically articulate children are sometimes difficult to interview effectively, for a whole range of personal, social and cultural reasons.

It is particularly timely to raise this methodological issue in relation to research concerning environmental education and education for sustainability as we have now entered the international United Nations Decade of Education for Sustainable Development. This proclamation has placed education in general and environmental education in particular, at the forefront in these new times of important and uncertain meanings (Caride, 2005). However, the topic of sustainable development embraces several different discourses, some of which are mutually exclusive, leading to confusion and controversy (Barraza et al., 2003). Redclift's position raises questions on, for example, what is to be sustained? How can sustainability be measured in different cultural contexts? How are needs defined in different cultures? Redclift argues that one of the reasons why the concept of sustainable development is so full of tensions and contradictions is because different people identify the objects of sustainability differently. Meeting some people's "needs" effectively excludes the needs of others (Barraza et al., 2003).

The legitimization of education for sustainable development in the educational mainstream is a first step which can be followed by reformation and transformation of the educational system itself at the micro-level – that of schools – and at the macro-level of policy development and implementation (Barraza et al., 2003). We believe there is a need to incorporate some principles in the educational agenda in order to achieve a sustainable society. A first principle could be to develop pedagogy for sustainable development based on socially-constructivist, transformative and participatory approaches. This requires teaching and learning methods that promote a critical and a reflective perspective in their learners. A more

dynamic and interactive learning approach could be promoted in countries like Mexico in which the memoristic and linear approach is still the dominant paradigm.

The education for sustainable development discourse forges a link between education and sustainable development by interpolating economic values into environmental education practice. Therefore, education for sustainable development explicitly directs education efforts towards the promotion, understanding and potential implementation of sustainable development, and to reconciling views on conservation and development interests which might previously have been in tension (Barraza et al., 2003).

One's cultural background and social context play a significant role in the way people think, feel and act in relation to the surrounding environment (Cohen, 1992). In this article we are interested in gaining representations of individuals' mental constructions concerning the environment. We wish to address the research methodology issue posed by a socially-constructivist education for sustainable development by recounting experiences from two projects which adopted alternative (that is, non-interview) means of gaining representations of participants' constructions of environmental issues. One project used the approach of analysing children's drawings; the other employed participant-directed photography as the principal data collection method. We now tender two 'Files' reporting on these projects, with a focus on the relationship of the data collection method and the substantive topics being investigated.

Children's Drawings as Constructions of Environmental Issues

Environmental sciences have made little use of drawings as a method of analysing children's constructions of the environment. The analysis of drawings is a robust, novel and useful tool for the field of environmental sciences (Barraza, 1999). Children's drawings can be regarded as useful tools that provide valuable information for the assessment of children's environmental knowledge, attitudes and perceptions (Barraza, 1999). Analysis of children's drawings is a powerful tool, since most children tend to enjoy drawing without showing any sign of tension. While many children dislike answering questions, drawings can be completed quickly, easily and in an enjoyable way (Lewis & Greene, 1983). According to Chambers (1983), drawings avoid linguistic barriers and enable comparisons between groups of different languages and abilities.

Examples of the Use of Drawings To Gain Representations of How Children in Mexico Understand Environmental Issues

We present two studies from Mexico. The first study shows an example of research in education for conservation:

- How children from primary education of three different regions of Mexico perceived their biodiversity.

The second study shows one example of children's environmental expectations of the future in a southern state of Mexico. The biological and cultural diversity that Mexico has makes it one of the fifth most diverse countries in the world. A great number of rural communities in Mexico ignore the biological richness of biodiversity that surround them and few studies look at the importance of educational research for the conservation biology of the species. Therefore working with children's environmental knowledge, attitudes and perceptions is fundamental for the planning of environmental education and conservation programs in situ.

Children's Drawings About Biodiversity

Children participating in the study were from primary schools (10 to 12 year old) of three different states of Mexico: Sonora, Michoacán and Chiapas. These states were chosen due to their biological and cultural richness so as their geographical location: Sonora is part of the Nearctic region, Michoacan share ecosystems from the nearctic and neotropical region and Chiapas belongs to the neotropical region of Mexico. A total of 1500 drawings were analyzed, 500 for each state. Using content analysis (Barraza, 1999) each drawing was carefully reviewed and classified according to what children drew in ten categories:

- 1) *Homobiodiverse* (Children drawings in this category included human activity and biological diversity);
- 2) *Environmental problems* (Drawings in this category showed actions in favor or against nature, and their concern for the present and future);
- 3) *Forest* (This category groups the representations of forest ecosystem);
- 4) *Sea* (Included marine animals and plants in the deep sea);
- 5) *Coast* (Drawings in this category represents human activity and events that occur in the coast line);
- 6) *Desert* (Arid areas with cactus, red skies, and a variety of reptiles);
- 7) *Landscape* (In this category drawings represents mountains with waterfalls and trees);
- 8) *Exotic* (This category included non Mexican environments such as glaciers, tundra and African savanna);
- 9) *Species* (A particular species is shown in this category like a photograph of their favorite animal);
- 10) *Biodiversity* (Representations of ecosystems and species are depicted in this category).

Results showed that children from 4° and 6° grade of primary level of three different regions in Mexico have basic skills to depict in their drawings elements of their biodiversity. In general children's drawings showed a moderate level of environmental knowledge. This knowledge gradually increases according to their age. Children were able to recognise differences among species and interactions between different animals. They depicted morphological differences in their drawings such as: types of beaks, legs, flippers, among others. They also drew different types of trees, grasses, shrubs and cactus and depicted interactions between plants and animal and between animals (predation). Some children were able to draw well detailed events of animal behaviour like parental care and dominance behavior (Plate 1). Children's knowledge about the physical elements that animals and plants need showed that they identified water and sun as basic elements for the livelihood of an ecosystem. Children associated plants and animals to particular ecosystems. Local symbolism was found as children from Sonora drew more arid ecosystems with animals from the desert than children from Chiapas and Michoacan (Plate 2). Children from Chiapas identified more forest and rural areas within human activity in their drawings than children from the other regions (Plate 3). Children from Michoacan were more concerned with drawing turtles than children from Chiapas and Sonora. It is important to mention that the coast of Michoacan is the main continental nesting beach of three species of marine turtles. Children were able to provide information on the reproductive behaviour of sea turtles and measures on how to protect them and recognized morphological differences between different species found in the coast of Michoacan (Barraza et. al., 2005).

About 10% of children's drawings identified environmental problems (ecological crisis, death of species, deforestation, fires, waste, water and air pollution). Children expressed a

high level of information on different aspects about the biology and morphology of different animals (jaguars, monkeys, deer, squirrels, toucans, snakes, turtles, butterflies, among others).

From these drawings we can see that in general children have shown a basic level of information about the biodiversity that they have in their region. They also provide through their drawings a lot of environmental information that could help teachers reorient their educational programs at school. According to Grob (1995), environmental awareness is a component represented by the environmental knowledge and the recognition of environmental problems. In the case of these Mexican children we can conclude that they have a moderate level of environmental knowledge.

Children's Drawings of the Future

Through the analysis of drawings we can also obtain valuable information in the field of future studies (Barraza, 1999). Drawings can provide information about children's concerns and expectations of the future. The progress and welfare of present and future generations depends to a great extent on positive and timely solutions to socio-economic and ecological problems which arise from the relationships between humans and nature (Robottom, 1992). We need to understand the future for which we are preparing ourselves (Toffler, 1974), and of course one of the major goals in education is to prepare young children for the future. Education should be about creating possibilities, not defining the future for our children (Wals & Jickling, 2000). Education for the future provides an opportunity for empowerment, so that children can work towards their chosen future. Therefore, images of the future play a crucial role in relation to human behaviour and actions in the present, at both personal and societal levels (Hicks & Holden, 1995). Children can reveal their fears and concerns about the world in their drawings, but at the same time they can think in numerous ways about being creative and designing proposals for changing unsustainable scenarios.



Plate 1. Drawing showing children's knowledge of animal behaviour like parental care.

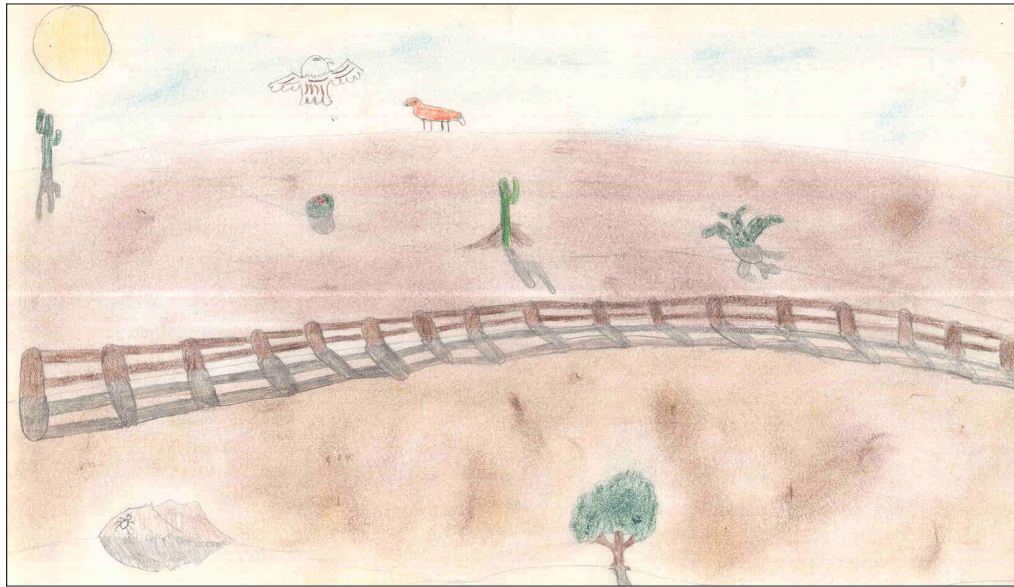


Plate 2. Local symbolism children from Sonora drew more arid ecosystems with animals from the desert than children from Chiapas and Michoacan.



Plate 3. Children of Chiapas identified more forest and rural areas within human activity in their drawings than children from the other regions.

The following example shows how children from Quintana Roo, a southern state in Mexico, manifested their hopes and expectations of the future through drawings. The state of Quintana Roo has great biological and cultural diversity and a beautiful coastal littoral zone (Cancun, Playa del Carmen, Isla Cozumel, Isla Mujeres, etc). After Australia, Quintana Roo has the second most important chain of coral reefs in the world. It also has three million hectares of forest of high biological richness, and an important number of lagoons and "cenotes" as a consequence of the geological formation of the peninsula. It is, too, one of the most important Mayan sites of the country with archaeological sites like Tulum and Akumal.

Quintana Roo is an area of high growth and urban development; this is why the promotion of an environmental culture among the population is important, particularly among children as members of the next generation of adults. In this context we worked with 200 children (12 years of age) from 6th grade of primary level. Drawings were used to determine how children perceived their environment and what their expectations will be in the future.

Children were invited to draw how they imagine Mexico will be in the future. We collected 200 drawings. Using content analysis (Barraza, 1999), drawings were analysed separately. All drawings were then used in the construction of thematic categories. Based on the different patterns that emerged six categories were constructed:

- 1) *Positive view.* Children's drawings in this category manifested a high sense of optimism. Everything was fine and in good balance;
- 2) *Negative view.* In this category children manifested a pessimistic view of their environment;
- 3) *Technological innovation.* In this category children manifested their creativity through their imagination by creating apparatus and machines that will exist in the future;
- 4) *Environmental solutions.* Children's drawings in this category were clearly responding to the need for solving environmental problems;
- 5) *Environmental concern.* In this category children demonstrated their worries towards the environment; and
- 6) *Life in other planets.* Children's drawings in this category showed a diversity of life in different planets.

Overall, children were clearly interested in the future of Mexico. A high percentage (85 percent) showed an optimistic outlook for the near future; their drawings revealed that things will improve and Mexico will get better (Plate 4). Only 15 percent had a pessimistic view, particularly expressing fear of aliens violently invading Planet Earth. Another 24 percent of the children demonstrated their creativity by drawing a futuristic Mexico with elevated houses in different shapes and flying vehicles; 16 percent of the children depicted in their drawings sophisticated apparatus to solve environmental problems like air cleaning machines, solar energy vehicles, special rubbish containers and different artefacts that will prevent water and air pollution (Plate 5). A small percentage of children (7 percent) manifested some environmental problems in their drawings mainly air pollution, scarcity of water, deforestation and rubbish. Also 15 percent of the children drew life in the moon and under the sea and aliens living on Earth (Plate 6).

To visualize the future in a positive way is a tendency that speaks to hope and commitment to solve the environmental crisis. However the small percentage of children that identified environmental problems can indicate that:

- 1) children recognized environmental problems, but they simply do not want to depict them in their drawings; or

- 2) children do not identify environmental problems and therefore they do not draw them.



Plate 4. Drawings depicting how things will improve and Mexico will get better.

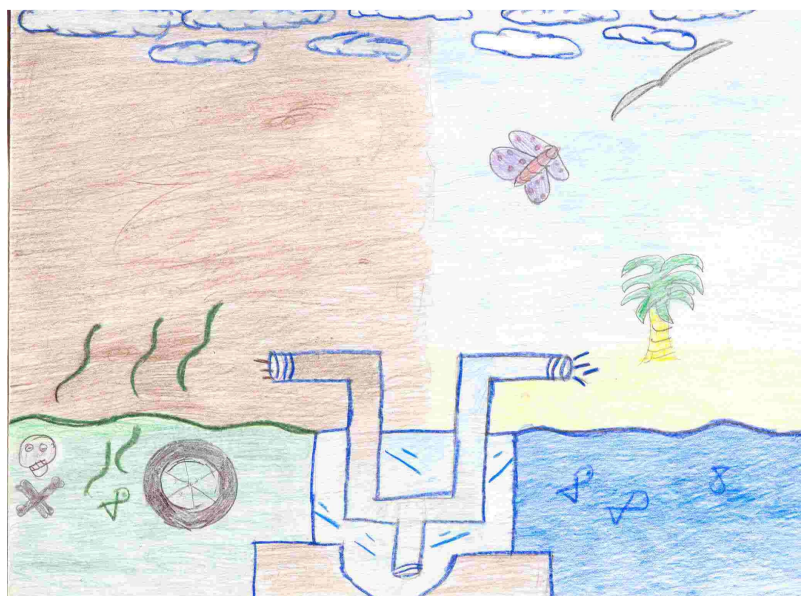


Plate 5. Vehicles, special rubbish containers and different artefacts that will prevent water and air pollution.



Plate 6. Life in the moon and under the sea and aliens living on Earth.

This example of gaining representations of individuals' constructions of sustainability issues concerned very young people – individuals for whom it is reasonable to expect that they could best articulate their constructions of sustainability issues through their own drawings. This research serves to indicate how individuals' use of media is one valuable means of conveying their constructions of such issues. We will now provide a perspective on adults' use of media (in this case auto-photography rather than personal drawings) to develop and portray their constructions of local sustainability issues.

Using Photographs To Develop Representations of Environmental Issues

The approach reported here was employed in a collaborative research and development project involving several Australian and South African universities and teacher training institutions. The project was conducted mainly in the north of South Africa (Lotz & Robottom, 1998; Robottom, 2003; Robottom & Kyburz-Graber, 2000).

The project entitled "Educating for Socio-Ecological Change: Capacity-building in Environmental Education, focussing on South Africa's tertiary educators" (hereafter referred to as the Auslinks project), was funded by AusAID and administered by IDP Education Australia as one of its Australia/South Africa Institutional Links projects.

Part of the project aimed to develop new curricula in South Africa that were based on and reflected issues within their local community contexts. Located as the project was in immediately post-apartheid South Africa, it was considered important that the process of curriculum development was conducted in a way that was as free as possible from the traditional top-down power relations that had characterised curriculum development during the apartheid era. The decision was taken to begin this curriculum development process by identifying a means by which local participants could develop representations of local environmental issues of interest and concern to them with minimal outside influence, including influence emanating from the researchers themselves. Photography came to be the

basis for gaining these original and independent representations. In summary the process, which occurred over a number of workshops spanning a period of two years, played out in this way:

- Cameras and film were distributed among project participants in six different regions within South Africa;
- Participants were each asked to prepare a portfolio of perhaps 35 photographs depicting an environmental issue of interest and concern to them and to their respective local communities;
- Participants prepared captions of a paragraph or so to accompany the selected photographs;
- The photographs and captions were sequenced in order to provide a representation of the environmental issue deemed to be of interest and concern;
- Participants progressively developed an illustrated case study of the issue as the photographs and captions were embedded within a growing narrative account of the issue. This process was in part the responsibility of the individual participants, and in part an outcome of collaboration within the group of participants as they read and commented upon each others' developing case studies;
- The photographs proved to be important in providing continuity and focus to discussions aimed at firming up the case studies;
- The draft case studies were circulated among at least two other participants who provided critical feedback verbally and in the form of annotations on the text. Feedback was also provided in a plenary setting: all participants present engaged in a discussion about the developing accounts. It should be pointed out that at this stage of the process relationships of trust were fairly well established between the participants; this level of trust facilitated the processes of collaborative critique that were central to our writing of the texts;
- Final versions of the individually and collaboratively developed illustrated case studies formed the basis of curricula for use in the local community.

In this Auslinks project, a link between South African researchers and Australian researchers was actually initiated by the South African environmental educators with a view, in part, to strategically base the project on the principles of participatory, community-based research. This was an opportunity for environmental education research to attempt (in some small way) to actively engage and perhaps partly redress some of the effects of a recent and very obvious history of oppression – namely the historical denial of opportunity for people of colour to develop and shape their own educational materials and experiences.

The use of cameras as a device for participants to capture images of issues of relevance to them was consistent with the principles of participation and responsiveness; in the event, the issues that were explored through the participant-developed case studies were selected totally by participants and explored by them in response to perceptions about local community needs. A clear example of this was the choice in the North-West Province of the issue of AIDS/HIV in the mining community at Rustenburg. This issue was of crucial importance to members of that community (there was a very high infection rate among miners and their families) and prior to this project there were no educational curricula that addressed the issue. The situation prior to the project (that is, in apartheid times) was one in which the curriculum was developed and controlled by a white minority government whose self-interests in education did not include the provision of educational material relating to the AIS-HIV problem experienced by black mining communities such as that at Rustenburg. Only in the period of social reconstruction following the dismantling of apartheid were the

principles of participation and responsiveness informing the AusLinks project able to become enacted. The use of photographs was an important means by which project participants were able to develop vivid representations of social/environmental issues of deep and vital interest and concern to them that could become embedded in new community-based curricula that addressed directly the AIDS/HIV issue within Rustenburg.

Children's Drawings and Auto-Photography as Means of Gaining Representations of Constructed Meaning in Environmental Education: Concluding Remarks

This research reports two related methods for capturing representations of individuals' constructions of environmental sustainability issues. When working with adults, auto-photography is a ready means of providing adult research participants with a means of illustrating the ways they perceive the environment. For very young children, operating a camera might not be an option, so making use of their interest in and capacity for composing their own drawings of the things around them becomes an important methodological alternative. Both of these means of gaining representations of individuals' perceptions are consistent with constructivist approaches to educational research methodology.

Cognitive development and drawings skills are important factors to consider when analysing children's drawings. The information children have about an environmental issue is one factor shaping their construction of the issue. But learning is an active process in which learners construct new ideas or concepts based only partly upon their current/past knowledge (Bruner 1990) – these constructions are also shaped by other life experiences. The use of drawings as a methodological approach enables children to create new personalised representations of their constructed meanings. The examples of drawings shown in this article reveal that children aged 6 to 12 have some key information of environmental concepts and sustainability issues such as: endangered species, illegal wildlife trade, pollution, illegal commerce of eggs and predation, urban development, social and economic problems.

If applied properly, the use of drawings is consistent with the idea of social constructivism in the sense that it provides a means of gaining representations of students' constructed meanings relating to these kinds of environmental issues – children are encouraged to construct their own representations of such issues in their drawings. The students, in their drawings, are able to present their personal understandings in ways that are unfettered by prior views on the issues that might be held by teachers or researchers.

The quality of student learning outcome is enhanced through a focus on affective domains of learning such as 'enjoyment' and 'emotion' (Ballantyne et al., 2001). The use of drawings and photographs to conduct research in socially constructivist ways is an effective and powerful tool, partly because it allows expression of such qualities as enjoyment and emotion. It encourages children to work in an integrative manner the two important areas of human development: cognitive and affective domains. The affective domain (feelings and emotions) seems to be crucial in the way students represent how they think and learn. Clearly, further research should be carried out to identify the range of ways learners depict significant environmental problems such as pollution, nuclear waste and global warming (Barraza, 2001). Children's drawings can thus provide valuable information on the development of children's environmental perceptions (Barraza, 1999).

The strategies used by children in making drawings are of interest not only because they allow us to make a more satisfactory analysis of children's art, but also because they open up the possibility of progress in understanding the development of planning and organising skills in general, a fundamental principal in constructivism. The examples showed that much

about children's perceptions and environmental information can be revealed through drawings (Barraza, 1999).

Similarly, the use of auto-photography by adults also resonates with socially-constructivist theories of how people learn. If it is the case that in any educational setting (formal or informal) people construct meaning in ways that are shaped by their own personal and cultural biography, then the use of photographs as a means of gaining representations of these constructed meanings seems an appropriate method of data collection. The process of capturing, selecting, sequencing and narrating images (in short the development of photographic essays) that constitute a personal or collaborative depiction of an environmental issue 'through participants' own eyes' is in a sense a way of translating an internal mental meaning-construction into a more tangible form that may be engaged by others, including researchers.

In this article we have argued that the use of children's drawings and the development of photographic essays by adults amount to another justifiable means of gaining fairly direct representations of meaning construction for research purposes. We have provided examples from our own research of how these data collections methods may be used in ways that resonate with socially-constructivist principles of environmental education research.

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